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Pain behaviors and hemodynamic parameters of intubated and sedatized intensive care patients during aspiration

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Abstract

The study was conducted in a descriptive type to evaluate the pain behavior and hemodynamic parameters during aspiration of intubated and mildly sedatized patients in the intensive care unit. The study sample consisted of 100 intubated and sedatized patients who were hospitalized in the Anesthesia Intensive Care Unit of Harran University Faculty of Medicine Hospital between February 2018 and June 2018. "Patient Information Form", "Hemodynamic Parameter Form", "Behavioral Pain Scale (BPS)", "Ramsay Sedation Scale" and "Glasgow Coma Scale (GCS)" were used to collect the data. There is a significant difference between the BPS total and subscale scores, mean "systolic and diastolic blood pressure", "heart rate", "respiratory rate" and "SpO_2" before, during and after aspiration (p=0.0001), it was determined that the difference was due to the average score after aspiration (p=0.0001). While the SpO_2 averages of intubated and sedatized intensive care patients decrease during aspiration, the averages of the BPS scores and other hemodynamic parameters increase.

Keywords: Intensive Care Patient, pain behavior, hemodynamic parameter, aspiration

Introduction

Pain, which is a common symptom in intensive care units (ICU), defined by the International Society for the Study of Pain (IASP) as a sensory, emotional and bad experience due to actual or possible tissue damage [1]. It has been reported that 50-70% of intensive care patients experience pain that increases the risk of morbidity and mortality [2-4]. Pain may be related to the patient's current medical diagnosis or other underlying problems, as well as a result of many procedures performed for diagnosis and/or treatment [3,4]. Interventions that cause pain in intensive care include position changes, central catheter insertion, removal of chest drains, wound care, removal of femoral arterial catheters, endotracheal aspiration, etc. [4,5]. It's reported in the literature that endotracheal aspiration is one of the most painful procedures among these [1,3,4]. In intubated patients, anesthesia with sedative drugs results in prolonged immobility, impaired ciliary movement and cough reflex. In addition, there is an increase in the production of respiratory secretions in these patients and they have difficulty in expelling these secretions themselves. For this reason, aspiration of secretions when necessary has vital importance. As a result, healthcare professionals should be more sensitive in observing pain-related changes during the aspiration [5-8].

Nurses in intensive care unit have important responsibilities for the diagnosis and management of pain, but it has been reported that pain is an overlooked symptom in intensive care unit and nurses do not use pain scales adequately and correctly [2,4,5,8,9]. This situation may lead to inadequate pain management and related complications. Therefore, intensive care nurses should observe the physiological and behavioral changes in the patient during the interventions that have potential for causing pain, use the pain assessment scales prepared in this regard accurately and effectively and record the hemodynamic changes that occur in the patient [1,5]. During aspiration, examining the indicators of pain occurring will increase the quality of care. When the literature is analyzed; there are few studies in our country in which pain behaviors and hemodynamic parameters were evaluated together in intensive care patients during the aspiration process. Therefore,

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the study was conducted descriptively to evaluate the pain behavior and hemodynamic parameters during aspiration of intubated and mildly sedatized patients in the intensive care unit. It's thought that the study make an important contribution to the intensive care literature with this aspect.

Materials and Methods

Participants and Procedure

This study was conducted descriptively and observationally. The population of the study consists of intubated and sedatized patients in the Intensive Care Unit of Harran University Faculty of Medicine Hospital. The sample of the study which was calculated by performing power analysis, consisted of 100 patients with 0.05 error and a 95% confidence interval with the power of representing the population at 0.95.

The data of the study were collected between February 2018 and June 2018. Intubated and sedatized patients with a "Glasgow Coma Scale" score above 3 and a "Ramsay Sedation Scale" score between 2-3 were included in the study. Intubated and sedatized patients who could not express their pain verbally because they could not communicate verbally were selected for the study sample. Patients under the age of 18, with a Glasgow Coma Scale score of 3, with diagnosis of sepsis, drug use, diagnosis of psychiatric disease, intracranial pathology, motor deficit, use of neuromuscular blocking agents and anticholinergic agents were not included in the study.

Research data were collected using "Patient Information Form", "Hemodynamic Parameter Form", "Behavioral Pain Scale (BPS)", "Ramsay Sedation Scale" and "Glasgow Coma Scale (GCS)" by the researcher in the anesthesia intensive care unit between 08:00 am and 16:00 pm. The researcher first obtained the age, gender, education level, medical diagnosis, analgesia status of the patients, GCS, Ramsay Sedation Scale scores, intubation day and length of stay in intensive care unit from nurse observation records. Then, observed the patients before, during and after the endotracheal aspiration performed by the nurse and evaluated their pain with the "Behavioral Pain Scale" and sedation status with the "Ramsay Sedation Scale", recorded the hemodynamic parameters in the hemodynamic parameter form by looking at the patient's monitors.

The study was adhered to the Declaration of Helsinki. Written permission was obtained from the chief physician and the nursing services directorate of the hospital where the study was conducted. Permission was obtained from the "Harran University Faculty of Medicine Ethics Committee" (01.2018-Decision number: 552). First-degree relatives of the patients were informed about the study and verbal consent was obtained for their patients to be included in the study.

Scales

Patient Information Form

In this form developed by the researchers in line with the literature; the personal characteristics of the patients (age, gender, education level, diagnosis, GCS and Ramsay Sedation Scale scores, intubation day and length of stay in intensive care unit) are questioned and the form consists of 6 questions intotal [10-12].

Hemodynamic Parameter Form

This form consists of a chart that records the heart rate, respiratory rate, systolic and diastolic blood pressure and SpO_2 (saturation) values of the patients before, during and after the aspiration.

Behavioral Pain Scale (BPS)

Vatansever and Eti Aslan conducted the validity and reliability study of the scale in our country, which was developed by Payen et al. (2001) to be applied to intensive care patients [13,14]. The scale consists of 12 items in total and includes three subscales (compliance with mechanical ventilator, extremity movements, facial expression). Each subscale consists of four item and examines behavioral responses caused by pain. These are "face expression"; relaxed, partially tightened, fully tightened, grimacing, "upper limbs"; no movement, partially bent, fully bent with finger flexion, permanently retraction, "compliance with ventilation"; tolerates ventilation, coughs but often tolerates ventilation, fights ventilators, unable to control ventilation. Each subscale is scored between 1 (no answer) and 4 (complete answer). The highest score obtained from the subscales is 12 and the lowest score is 3. The increase in the score explains the increase in the level of pain. The "Cronbach Alpha Value" of the scale is between 0.71 and 0.93 [15]. In this study, it was found to be 70.1.

Ramsay Sedation Scale (RSS)

This scale, developed by Ramsay (1974), is frequently used in studies investigating the pain level of intensive care patients in our country to determine the level of sedation [16,17]. Three items in the scale evaluate the wakefulness and the other three items evaluate the sleep pattern. These are, respectively, "The patient is restless and/or agitated, oriented, calm and cooperative, obeys only commands, obvious response, reduced response and no response". The evaluation of the scale is made by scoring from 1 to 6. As the score increases, the sedation level increases too.

Glasgow Coma Scale (GCS)

The Glasgow Coma Scale is used to record a person's state of consciousness reliably and objectively. When the patient is evaluated according to the criteria of the scale; the patient gets the highest score of 15 and the lowest score of 3. While calculating the scale, three basic parameters are questioned: evaluation of eye response, evaluation of verbal response, and evaluation of motor response [17].

Statistical Analysis

SPSS 22.0 program was used for data analysis. Number and percentage distribution; analysis of variance and t analysis with bonferroni correction in repeated measures in dependent groups; Pearson's correlation analysis was used. All hypothesis controls in the study were evaluated according to α 0.05 ($p<0.05$) significance level.

Results

It was found that the majority of the patients were male (60%), aged 65 and over (50%), graduated from primary school (53%), were treated for multi-organ failure (30%) and did not receive analgesia

(90%) (Table 1). In addition, it was found that the mean GCS score of the patients was 8.1±1.04, the mean Ramsay Sedation Scale score was 2.51±1.12, the day of intubation was 6.37±7.81 and the lenght of stay in intensive care unit was 10.23±18.78 (Table 1).

It was found that the difference between BPS total and subscale mean scores before, during and after aspiration was significant (p=0.000) and this difference was due to the average pain score during aspiration (2>1.3; p=0.000) (Table 2).

There was a highly significant difference in mean systolic and diastolic blood pressure, heart rate, respiratory rate, SpO_2 scores before, during and after aspiration (p=0.000). It was determined that the difference between the average SpO_2 score arose from the average score after aspiration. It was found that the difference between the mean scores of systolic and diastolic blood pressures, heart rate and respiratory rate was due to the average score during the aspiration (Table 3).

Table 1. Distribution of the descriptive characteristics of the patients

	Mean±SS	Min-Max
GKS	8.1±1.04	8-11
Ramsay Sedation Scale	2.51±1.12	2-3
Intubation Day	6.37± 7.81	1-36
The day of intensive care stay	10.23 ±8.78	1-45
	n	**%**
Gender		
Female	40	40
Male	60	60
Age Group		
18-45	15	15
45-65	35	35
65 and over	50	50
Education Status		
Primary education	53	53
Secondary education	37	37
License	10	10
Disease Diagnosis		
Multiple organ failure	30	30
Stroke	20	20
Respiratory Failure	15	15
Intracranial bleeding	13	13
Chronic Heart Failure	7	7
Sepsis	5	5
Cancer	5	5
Analgesia Receiving Status		
Yes	10	10
No	90	90
Total	100	100

% : Percentage

Table 2. Comparison of the distribution of the mean scores according to the total and sub-items of BPS during the Aspiration Application Process (n = 100)

Indicator	Application Process Scale Scores			Test value*	p	Binary rating, p**
	pre[1]	during[2]	post[3]			
Face expression	1.02±0.34	2.99±0.81	1.04±0.15	101.69	0.000	p2>p1, p3
Upper limb movements	1.11±0.47	2.26±0.28	1.19±0.53	95.74	0.000	p2>p1, p3
Compliance with ventilation	1.05±0.38	1.72±0.69	1.14±0.37	44.36	0.000	p2>p1, p3
Total score	3.13±1.13	6.96±2.10	2.99± 1.39	120.103	0.000	p2>p1, p3

*Oneway ANOVA Test, **Post Hoc: Bonferroni Test

A statistically significant, low and positive correlation was found between the "Glasgow Coma Scale" scores (r=0.358, p=0.026) and the BPS total score during aspiration and the lenght of stay in intensive care unit (r=0.332, p=0.040). As the length of stay in the intensive care unit and the "Glasgow Coma Scale" score increases, the BPS total score increases. There was a statistically significant, low level and positive difference between the patients' "Glasgow Coma Scale" scores and the BPS "facial expression" (r=0.361, p=0.004) and "upper extremity movements" subscales (r=0.028; p=0.004). As the Glasgow Coma Scale scores increase during aspiration, the BPS "facial expression" and "upper extremity movements" subscale scores also increase. A statistically significant, low and negative correlation was found between the "Ramsay Sedation Scale" scores and the BPS "upper extremity movements" subscale score during aspiration (r=0.277, p=0.026). As the "Ramsay Sedation Scale" scores increase during aspiration, the BPS "upper extremity movements" subscale score decreases (Table 4).

Table 3. Comparison of hemodynamic parameters in Aspiration Application Process (n=100)

Parameters	Application Process Scale Scores			Test value *	p	Binary rating, p**
	pre[1]	during[2]	post[3]			
Systolic blood pressure	125.03±13.42	148.20±11.07	133.60±11.33	76.202	0.000	p2>p1, p3 p3>p1
Diastolic blood pressure	71.49±10.44	84.16±10.10	73.28±10.48	66.130	0.000	p2>p1
Heart rate	83.25±9.66	98.50±12.37	89.00±10.10	60.405	0.000	p2>p1, p3 p3>p1
Respiratory rate	19.20±3.15	24.03±4.00	20.26±5.31	45.201	0.000	p2>p1, p3
SpO2	95.00±2.79	96.54±2.01	97.28±2.08	83.906	0.000	p3>p1, p2 p2>p1

*Oneway ANOVA Test, **Post Hoc: Bonferroni Test

Table 4. Investigation of the relationship between intensive care characteristics of patients and BPS and subscale scores during aspiration

		Facial expression	Upper extremity movements	Compliance with ventilation	Total
Hospitalization time in intensive care unit	**r**	0.190	0.096	0.280	0.332
	p	0.121	0.235	0.108	0.040
Intubation Day	**r**	0.206	0.093	0.104	0.142
	p	0.500	0.116	0.299	0.427
Glaskow Coma Scale	**r**	0.361	0.028	0.047	0.358
	p	0.004	0.004	0.718	0.026
Ramsay Seduction	**r**	0.006	-0.277	-0.124	-0.107
	p	0.962	0.026	0.589	0.167

r: Correlation , Behavioral Pain Scale (BPS)

Discussion

Detecting the presence of pain, which is known to be highly experienced in intensive care units, poses difficulties in intubated and sedatized patients [8,17]. Therefore, it is recommended to use behavioral and physiological indicators when evaluating pain in patients who do not have this type of verbal response and did not undergo deep sedation [8,18]. In this context, this study was conducted to determine pain behavior and hemodynamic parameters during aspiration, which is a painful procedure in intubated and sedatized intensive care patients [4,5].

In this study, it was found that the majority of the patients are male, aged over 65 years and are being treated for multi-organ failure (Table 1). Similarly, in Mabel's study, it was found that a significant portion of the patients were male and the average age was 64. In the same study, it was observed that the majority of patients were treated for surgical reasons [19]. In other studies evaluated, it was found that the majority of the patients were male and the average age was over 60 [3,4,11]. In the study conducted by Robleda, it was found that the majority of patients were treated for surgical reasons and had analgesia [4]. It is thought that the differences in the results of the study are due to the fact that the analgesia treatment may vary according to the medical diagnosis of the patients.

As a result of the study, it was found that mean BPS total and subscale scores increased during aspiration. Similar results are found in the literature [4,19]. There is a false belief that patients with sedation do not feel pain and this situation causes considerable concern for intensive care patients in terms of their exposure to pain for a long time [3]. The result of the study supports the importance of behavioral indicators for pain assessment of intubated and sedatized intensive care patients.

There was a significant difference in mean systolic and diastolic blood pressure, heart rate, respiratory rate and SpO_2 scores before, during and after endotracheal aspiration. In some studies, there

are changes in hemodynamic parameters during aspiration, while some studies do not show any change [2,3,4,19,21-23]. Except pain, many factors such as cough, hypoxemia and anxiety may cause changes in hemodynamic parameters during aspiration [19]. Differences in research results suggest that changes in vital signs alone are not sufficient to determine the presence of pain.

In the study, a statistically significant and positive correlation was found between the "Glasgow Coma Scale" scores of the patients during aspiration and the BPS total score and the length of stay in the intensive care unit. In a study conducted by Damico et al., it was found that intensive care patients with pain had longer stay in the mechanical ventilator than patients without pain [17]. The similarity in the results of the research suggests that the increase in the duration of intensive care stay is due to the increase in exposure to painful procedures and also that the majority of the patients included in this study did not take analgesics. Because in the literature; it is stated that unresolved pain increases the intensity of pain [24]. In the study of Robleda, it was determined that both facial expression and movement of extremities changed significantly during the aspiration[4]. Korkutan Efe and Dedeli Caydam reported changes in facial expression (tightened and/or grimacing), non-compliance with the ventilator (coughing but tolerating) and muscle tension (tense or excessive tension) [25]. Carmen Mabel found increases in some behaviors (grimace, clenched fists, stiffness, fright, increased movement and increased facial responses) [19]. In intensive care conditions, it is very difficult for intubated patients with insufficient consciousness to show pain behavior. This research suggests that the increase in consciousness increases the behavioral responses to pain. In Ayasrah's study, it was seen that lower sedation level resulted in higher procedural pain [22]. Kahraman and Ozdemir found that RSS score significantly decreased during aspiration [11]. This will undoubtedly make it difficult to define pain in patients with sedation. Healthcare professionals should plan and implement care and treatment interventions, knowing that this condition affects the patient's pain behavior.

Limitations

The first limitation of the study is that research data can only be generalized to patients in the study group, but not to all intensive care patients. Another limitation is that research data are collected by a single researcher and there is no different observer.

Conclusion

In our study, it was determined that the BPS score, systolic and diastolic blood pressure, respiratory rate and heart rate averages increased while the average SpO2 decreased during the aspiration. In line with these results; intensive care nurses should be aware of the basic behaviors and changes that occur during aspiration. In particular, nurses caring intubated and sedatized patients who cannot communicate verbally should constantly observe, define pain, plan appropriate interventions in pain management and evaluate the results, taking into account the physiological and behavioral pain indicators of these patients. Changes in hemodynamic parameters should be considered as an indication to begin further evaluation for the presence of pain. More research is needed to understand changes in hemodynamic parameters that result from pain during aspiration.

Conflict of interests
The authors declare that they have no competing interests.

Financial Disclosure
All authors declare no financial support.

Ethical approval
The study was adhered to the Declaration of Helsinki. Written permission was obtained from the chief physician and the nursing services directorate of the hospital where the study was conducted. Permission was obtained from the "Harran University Faculty of Medicine Ethics Committee" (01.2018-Decision number: 552). First-degree relatives of the patients were informed about the study and verbal consent was obtained for their patients to be included in the study.

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